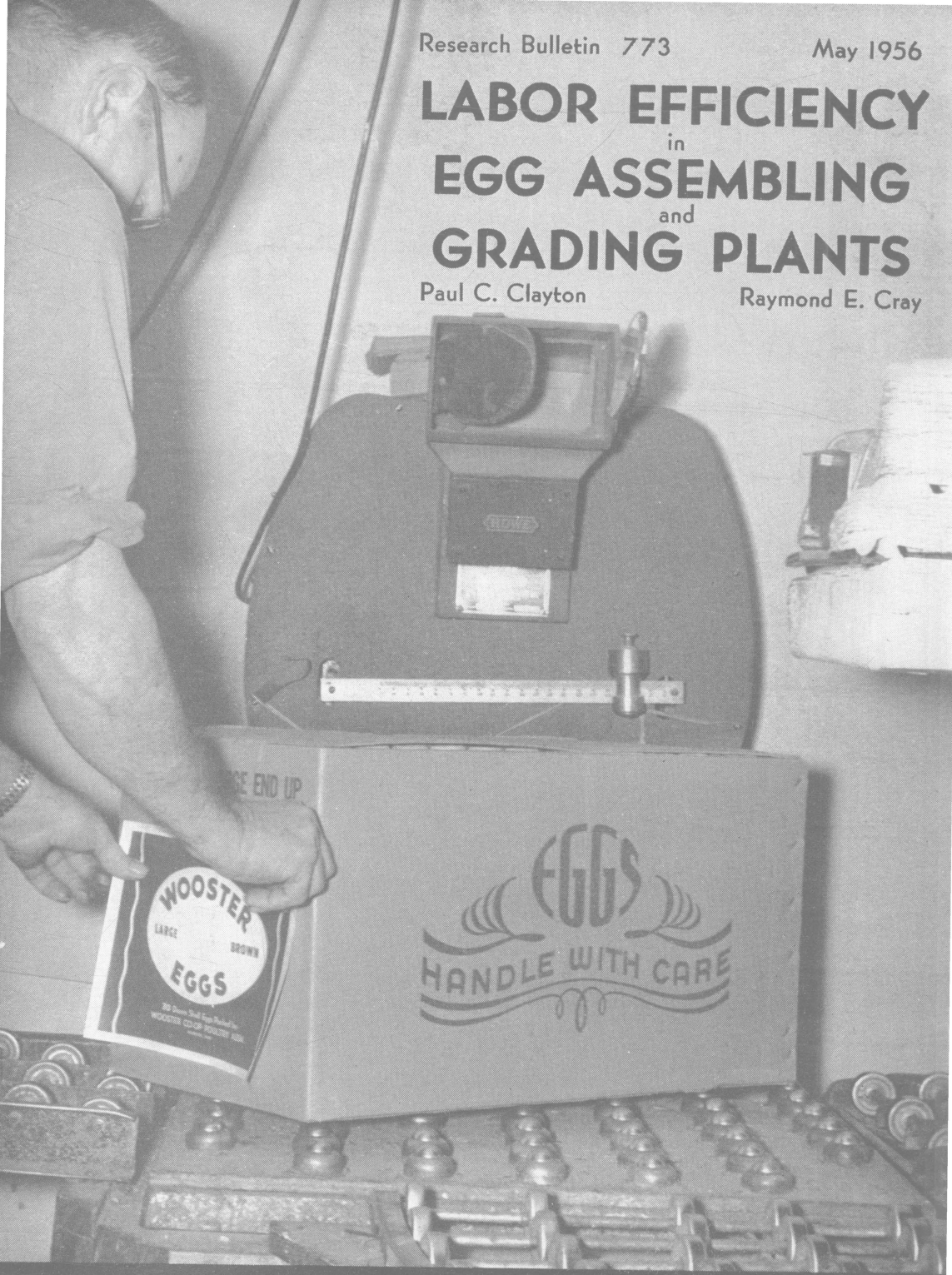
Research Bulletin 773 May 1956

LABOR EFFICIENCY in EGG ASSEMBLING and GRADING PLANTS

Paul C. Clayton Raymond E. Cray



OHIO AGRICULTURAL EXPERIMENT STATION
WOOSTER, OHIO

CONTENTS

* * *

LABOR EFFICIENCY IN EGG ASSEMBLING AND GRADING PLANTS

PAUL C. CLAYTON and RAYMOND E. CRAY

In 1953, there were over 240 million dozen eggs produced on Ohio farms bringing to producers a gross income of $113,881,000. Farmers marketed these eggs in a number of different ways with the methods varying in different parts of the state and also from one season of the year to another.

One of the more common and important middlemen in shell egg marketing channels, in terms of volume of eggs handled, is the "Central Egg Assembler and Grader".

Marketing agencies of this type are usually located in rural towns or cities and serve the function of assembling eggs from farmers, grading and packaging the eggs in either 30 dozen cases or one dozen cartons, or both, (depending upon the types of outlets to which the eggs are sold) and usually the delivery of the eggs to the terminal market outlet.

Many changes have occurred in the operating method of Central Egg Assembling plants during the last twenty years. Improved methods of assembly, refrigeration, grading, and transportation have brought about or resulted from changes in marketing practices.

Marketing services performed by marketing agencies in the shell egg industry have also been expanded as a result of the demand of both producers and consumers, and also as a result of competition.

In 1932, only one marketing agency in Ohio graded eggs under "Federal-State" supervision. During 1953 a total of 27 Ohio marketing agencies operating under supervision of the Federal-State egg grading program, graded or inspected a volume of eggs equal to 28.8 percent of all the eggs sold from Ohio farms.

Picking eggs up at the farms, insulation of the "pick-up" trucks, the use of mechanical refrigeration in processing plants and transportation of eggs in refrigerated trucks from country plants to city distributors all help to maintain egg quality, but such additional services inevitably increase the costs of marketing eggs.

With competition forcing egg assemblers to operate within a narrowing margin, and with rising costs of labor and equipment taking a larger percent of this margin, efficiency in grading and handling eggs in the assembly plants has become more and more essential in order to maintain a profitable plant operation.

Net profits may be increased in two general ways, either by increasing the volume of sales sold or by increasing the net operating margin per case. The net operating margin per case can be increased by either increasing the sales price or by reducing operating costs.

Since the cost of labor is one of the largest items of operating expense, the more efficient use of labor and the replacement of labor by mchanical equipment offers real opportunities for reducing operating costs.

PURPOSE OF THE STUDY

The purpose of this study was to: (1) Make a comparative analysis of the efficiency in the utilization of labor with various methods of operation and different types of equipment used in egg assembling and grading plants; (2) Determine the causes of the variations in the efficiency of the utilization of labor; (2) Study possible ways of increasing labor efficiency.

REVIEW OF LITERATURE

A number of studies have been reported on the use of various procedures in handling eggs, methods of grading, and of operational costs. Most of the cost studies in the poultry industry have been on margins between the producer and consumer rather than functional costs.

Physical Operations.—Dankers (1946) reported from observation and comparison of numerous egg and poultry buying and processing operations in Minnesota that there was wide variation in operating policies and in the effectiveness with which various phases of the businesses are carried out.

Trumpis (1946) reported that from a careful study of egg handling operations and the requirements of high speed operations, the best possible condition could only be obtained by setting up a work arrangement (candling booth) which was planned and designed so that the greatest possible degree of the candler's time would be spent in candling eggs.

Clarke, (1941) reported that in one plant where a moving belt system was installed, five cents per case was cut off the cost of candling and grading eggs. The employees candled the eggs into fillers instead of cases and place the fillers of eggs on the belt. The eggs were then transferred to another belt where they were size graded and sorted for color. A ticket showing the grade and the candler's number was placed in each flat of eggs. This system does away with a lot of unnecessary confusion, because the only people who move around are those keeping the candlers supplied with eggs.

Hurst (1946) reported that it was cheaper to grade fine quality eggs than poor quality eggs. The layout of the plant itself was another factor materially affecting efficiency and cost of shell egg operations. A dock high building offers much convenience for unloading trucks and loading railway cars and had proved to be far more economical than a ground level building even when the higher investment cost was taken into consideration.

Bailey (1948) reported that at the Connecticut Farmer's Cooperative Auction Association, which was one of the first plants to completely "conveyorize" its egg plant operations, modern methods of materials handling played an important part in profitable plant operations and keeping operating costs at a minimum. Other advantages of using conveyor systems include less breakage, less fatigue and absenteeism, and increased volume with a minimum amount of floor space.

Thompson (1949) reported a good deal of work has recently been done in England to incorporate efficiency of operations in the distribution of eggs. The grading operations employed by the Yorkshire Egg Packers, Drightington, England (the largest packing station in Europe) is claimed to be the most modern in the world. Two egg candlers feed each of six "B.M. & R. Graders". The machines are equipped with elongated overflow tracks, which deliver the eggs to a continuous belt conveyor separated with an intricate system of channels. In this system six packers are delivering the output of six machines (two candlers per machine), which not only limits the number of packers needed, but also enables management to locate them in a concentrated area handy to conveyors on either side of the room, which carry off the cases of graded eggs.

Paulhus and Delle Donne (1953) reported a wide variety in the types of equipment and facilities used in egg assembly plants. There were six different conveyor-belt candling and cartoning systems observed in plants. A number of plant operators have developed and are using improved handling methods, but many plants fail to provide adequate materials—handling equipment. Some of the methods and equipment which appear to have wide applicability include: modified egg case trucks, four wheel hand trucks, dollies, skid systems, chutes, gravity conveyors, and belt conveyors. In many cases a combination of several types of equipment will best serve the needs of a particular plant.

From a survey of egg assembling plants in Iowa, Eggleton and Paulhus (1954) concluded that the use of pallets and pallet handling equipment in egg assembling plants provides a number of possibilities for improved handling methods and reducing costs. The handling of

unit loads as large as 30 egg cases per pallet can substantially reduce the amount of labor needed and can speed up all loading, unloading, and transport operations. Powered equipment not only moves eggs faster but also improves working conditions. Where feasible and ceiling heights permit, stacking equipment can make better use of vertical space thereby increasing plant capacity within existing plant facilities.

Earle (1950) reported the average time required per 100 cases handled to perform the various functions in 12 New York egg receiving stations was as follows: loading empty cases—21 minutes, unloading eggs—76 minutes, combining cases—509 minutes, loading out—48 minutes. The use of roller conveyors and skids were found to be very efficient means of moving the eggs in and out of the plant.

Operational Costs.—Scanlan (1937) reported that apparently two principal factors directly or indirectly affect the total per unit operating costs of egg auctions, (1) the total volume of receipts handled, indicated numerically by the total number of units handled yearly, (2) the operating methods and practices of the association. Analysis of cost data for the year 1937 shows that auctions handling the largest volumes, with but few exceptions, tend to show the lowest costs.

Johnson (1949) reported that in presenting cost figures on a product, it is first necessary to outline the general operating procedure from which cost figures were developed. The cost figures in his report cover the operations at one plant for the year 1948. All eggs at this plant were consumer graded according to U.S.D.A. standards and were oil treated. Automatic sizing machines with hand candling attachments were used. Thirty-six percent of the shell eggs purchased by this plant were from truck routes, 27% from collecting station and 37% from door deliveries. Eighty-four percent of the eggs were shipped out as graded eggs and 16% were transferred to the egg breaking department. Egg procured through the stations were candled, graded, and shell treated at the station in the same manner as eggs handled at the central plant.

When station costs were applied to eggs handled at the stations, the adjusted actual average cost of processing, grading, shell-treating and handling eggs was $1.21 per 30 dozen cases of eggs.

Plant labor costs for packing eggs at the central plant was nearly $0.61 per case. Supplies (including cases) when applied to the eggs shipped out amounted to an additional $0.67 per case. When the cost of shipping labor was applied to the eggs actually shipped out, the cost of labor was $0.0275 per case. The over-all average cost of handling eggs at this plant was $1.81 per case.

In studying the marketing of shell eggs, Oderkirk (1939) found that comparisons between plants in country sections are difficult, owing to the lack of uniformity in grading, methods of handling, refrigeration and other items in handling eggs. While the extreme variability in costs may be due in part to differences in accounting methods used, the difference largely represents use of different types of facilities and the extent of grading involved. The average costs involved in grading, candling, and handling of eggs in 13 plants in Iowa during the 3 year period 1935 to 1937 was:

Assembling	.0075	cents	per	dozen
Candling cost	.0038	"	"	"
General labor etc.	.0010	"	"	"
Cases	.0117	"	"	"
Electricity, power, etc.	.0004	"	"	"
Supplies	.0003	"	"	"
Overhead	.0079	"	"	"

Priebe (1947) in working an "operating cost standard" for their plants found that since operating conditions were different in each plant, it was necessary to set up a standard for each type of plant. First, there were certain fixed expenses regardless of volume, and it was the first aim to handle enough units to at least keep these fixed expenses down to ¾¢ per unit. The following operating cost standard was developed; refrigeration and overhead 60¢, labor 32¢, and supplies 65¢ per 30 dozen case of eggs, plus the cost of grading loss.

Larzelere (1952) concluded from a time study of the various labor operations performed at four egg grading stations in Michigan that: (1) Considerable variation existed with respect to labor costs of candling, packaging and performing other operations for different days and for different stations. (2) Greater efficiency in the utilization of labor can be achieved by: (A) the use of a larger proportion of the candlers' time in actual candling operations, (B) Elimination of excessive rest periods and idle time, (C) The maintenance of optimum balance between volume of eggs and the number of employees and facilities available, (D) The improvement of physical facilities through proper location and the greater use of dollies and roller conveyors.

In a study of 29 New York wholesale receivers Earle (1950) found that wages and salaries amount to 43 percent of the operating expenses. The operating costs per case for the small receivers (less than 30,000 cases per year) were considerably greater than for the large receivers. The small receivers were not able to utilize fully the services of the labor available and on the payroll.

Ratcliffe et al. (1952) found a wide variation in direct costs per unit for most of the 13 operations among the 16 plants studied. For 12 operations (egg breaking not included) the average of the high direct labor costs per case was 3.9 times that of the low averages. Cartoning, for example required nearly four times more man-hours in one plant than in another plant. Labor costs, direct and indirect, constituted 44% of the total costs. Materials were next with 33%, and truck and other costs mostly indirect, made up the remaining 23 percent of the costs.

Beanblossom and Paulhus (1955) found that the completely mechanized grading, packaging and handling operations in a Texas plant lowered handling costs considerably. The elapsed time required to market eggs from producer to the retail store was reduced to a matter of hours.

TECHNIQUE USED IN MAKING STUDY

The "case study" method was used in analyzing the operations of nine central egg assembling and grading plants. Eight of those plants were in Ohio and one in Indiana. Five of the plants were operated by cooperatives and four were privately owned.

Information on the operating procedures such as methods of loading and unloading eggs, grading, the "flow" of eggs through the plant, and the equipment used in the plant was obtained by visiting each organization.

Cost data and volume reports covering the operation for a one year period were obtained from the plants where this information was available.

In order to acquire data on the use of labor in the plants, every employee in each plant was supplied with a form on which he kept a record of the number of hours (to the nearest 15 minutes) devoted to each of the various functions within the plant, (Appendix I). This was done for periods of one week each, at three different times during the year.

The first week during which employees kept a record of the time spent on various plant functions was the last of September and the first of October when the volume of eggs was low; the second week was during December when the volume of eggs was high; and the third week was during March when the volume of eggs was about average.

If an employee worked with both poultry and eggs, only the time spent in the egg department was recorded. The work within the plant was broken down into nine divisions which were further divided into 28

jobs or tasks (see Appendix I). Each employee indicated the amount of time spent on each job or task during each day of the one week periods at the three different seasons of the year.

PART I

GENERAL OPERATIONS OF THE CENTRAL EGG ASSEMBLING AND GRADING PLANTS INCLUDED IN STUDY

The primary functions of Central Egg Assembling plants are to assemble the eggs from the producers, grade the eggs according to size and quality, label the containers and sell the eggs to the next marketing agency in the channel of distribution from producer to consumer.

In one of the nine plants included in the study, the egg department was part of a dairy and cheese plant; four of the plants handled both poultry and eggs, and the other four plants handled eggs only. The percent of gross income from eggs ranged from 4.69 percent to the total operation in one plant to 100% of the total income in each of four other plants.

All the plants in this study assembled eggs from producers but there was considerable variation in the type and amount of grading done to the eggs in the different plants. Some of the plants also performed other operations such as cleaning eggs, cartoning eggs in one dozen cartons, oil treating for storage, and breaking and freezing liquid eggs.

TABLE 1.—The total volume of eggs handled and the percent of yearly gross income received from eggs, poultry and dairy products by nine central egg assembling plants

Plant Number	Volume of Eggs	Percent of Total Gross Income		
		Eggs	Poultry	Dairy
	30 doz. cases	Percent	Percent	Percent
1	109,488	100	.. ...	.....
2	80,991	100	.....	.....
3	136,295	100	.....	.....
4	62,137	97.0	3.0	.....
5	236,667	78.0	22.0	.....
6	51,203	85.0	15.0	.....
7	35,100	42.0	58.0	.....
8	19,895	4.6	.....	95.4
9	200,000*	100	... .	....
Total	931,776*	.... .	.....	.....

*Approximate.

The central egg assembly plants included in this study sold eggs to various types of middlemen including wholesalers, jobbers, chain stores, warehousers, and retailers. Most of the plants sold eggs to more than one type of marketing agency.

Volume

The volume of eggs handled during the year by the individual plants ranged from 19,895 to 236,667 cases (30 dozen eggs per case) (see Table 1).

Egg production follows a definite seasonal pattern, with 55.4 percent of the average yearly production in Ohio during 1950-52 being produced during the first 6 months of the year and 44.6 percent during the last six months. This seasonal variation in egg production has a very significant effect on both the weekly volume of eggs handled by marketing organizations and the operating efficiency of the plants.

Source of Eggs

Six of the plants bought all eggs directly from producers, one organization had a buying station which assembled eggs from producers for shipment to the grading plant. Two organizations purchased part of their eggs from producers and part from dealers.

Eggs Delivered or Picked Up At the Farm

There was considerable variation in the percent of the total volume of eggs that were delivered to the central assembling plants by producers and the percent of the total volume of eggs that were picked up at the farms by trucks operated by or for the central assembling organizations.

TABLE 2.—The percent of the total yearly volume of eggs which were delivered to the plant by producers and the percent picked up at the farm by each of the nine Central Egg Assembling plants

Plant Number	Total volume of eggs handled	Percent of total yearly volume of eggs	
		Delivered to plant by producers	Picked up at farm by marketing organization
	(cases)	Percent	Percent
1	109,488	46.0	54.0
2	80,991	8.0	92.0
3	136,295	10 0	90.0
4	62,137	3.0	97.0
5	236,667	9.0	91.0
6	51,203	1.0	99.0
7	35,100		100.0
8	19,895	4.0	96.0
9	200,000*	35.0	65.0
Average	931,776*	17.7	82 3

*Estimated.

Basis of Payment

Six of the plants paid producers for eggs on a graded basis, two on a "case count" [1] basis, and one plant purchased the eggs by both methods—whichever method the producer preferred.

Some of the plants buying eggs on a graded basis permitted the producers to grade their own eggs for size and the plant determined the quality of the eggs on the basis of an inspection by candling 100 eggs in each case.

Distribution of Operating Expenses

Information was secured from five of the nine central egg assembling and grading plants on the distribution of the plant operating expenses.

Labor was the biggest single item of operating expense in the five egg assembling and grading plants that kept a detailed record of operating expenses. The payroll or labor cost of the individual plants ranged from 64.0 to 65.8 percent of the total operating expenses.

[1] "case count"—term used to describe the purchasing of eggs at a certain price per dozen for the total number of dozens in the lot regardless of the size or quality of the eggs.

TABLE 3.—Percentage distribution of the items of yearly plant operating expense per case of eggs sold by five egg marketing organizations

Expense Items	Plant				
	#1	#2	#3	#4	#5
	%	%	%	%	%
Depreciation, maintenance and repair	5.9	9.5	4.4	1.6	2.3
Heat, light and water	1 5	1.0	1.1	1.1	1.5
Inspection service*	14.5	8.3	4.6	9.7	12.3
Insurance, general and employee	2.4	1.3	1.3	1.3	2.7
Office expense	6.0	6.1	5.9	8.6	7.7
Payroll	64.0	65.5	65.7	65.0	64.3
Plant supplies	.8	1.2	.4	2.1	1.2
Travel, field work and Director's Expense	1.3	2.9	4.8	4.8	1.8
Taxes, FOAB-OUC & other expense†	2.2	1.7	2.8	4.0	3.8
Rent				1.3	
Miscellaneous	1.6	2.5	9.0	.6	2.46
Total	100.0	100.0	100.0	100.0	100.0

*Some labor included in inspection service.

†F.O.A.B.—Federal Old Age Benefits.
O.U.C.—Ohio unemployment compensation.

TABLE 4.—The total volume of eggs sold, the labor cost and the total plant costs per case of eggs and the labor cost as a percent of total plant costs of five Ohio egg marketing plants during 1949-50

Plant Number	Total volume of eggs (30 doz. cases)	Cost of Plant Operation		Labor as percent of total
		Labor (cents per case)	Total cost (cents per case)	
		¢	¢	%
Number 1	109,488	38.4	60.0	64.0
Number 2	80,991	47.3	72.2	65.5
Number 3	136,295	51.9	79.0	65.7
Number 4	62,137	53.9	82.9	65.0
Number 5	236,667	33.7	52.4	64.3

Although labor accounted for a very uniform percentage of the total plant operating costs, there was a wide variation between the different plants in the average cost of labor per case of eggs sold.

The plant that handled the largest volume of eggs had the smallest labor cost per case and the plant with the smallest volume had the highest labor cost per case.

The labor cost of operating the five egg assembling and grading plants also varied within the individual plants during different seasons of the year due to the fluctuation in the weekly volume of eggs sold. There was a direct relation between the weekly volume of eggs handled and the labor cost per case of eggs, as volume went up, labor costs per case went down. (Charts 1 and 2).

The seasonal pattern of egg volume complicates the labor problem because more help is needed during the season of high egg production.

The amount of labor used per case of eggs sold varied because of differences in volume and operating efficiency, and also because of variations in the services rendered by the different plants.

Eggs were graded under Federal-State Supervision in all five plants, but there was considerable variation in the percent of the total volume of eggs that was graded according to "consumer grade" standards, in which every individual egg is candled, and the percent that was graded according to "wholesale grade" standards, in which the eggs are sized by the producer and the quality is determined by a candling inspection of 100 eggs in each case.

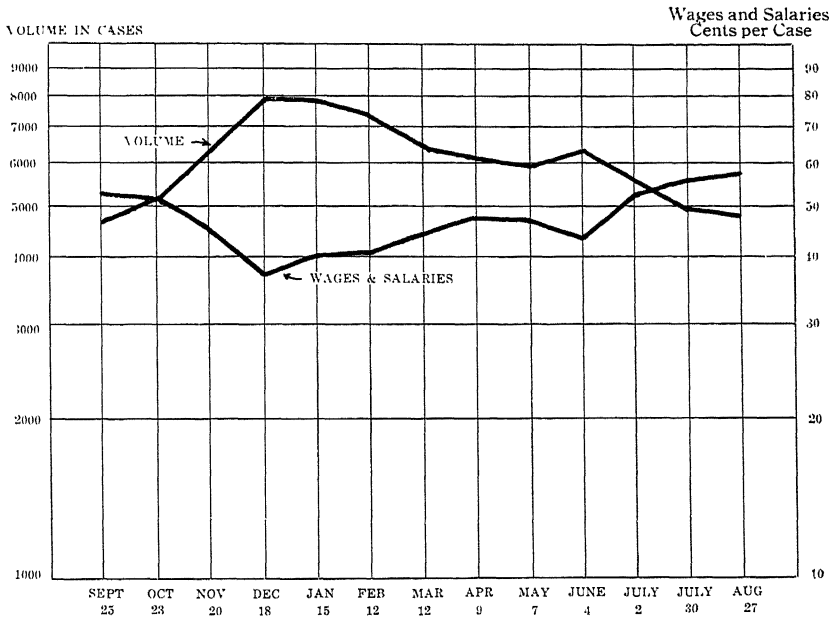


Chart 1.—The relation of the weekly volume of eggs to the plant labor costs per case of eggs handled in Plant #2, September 1, 1948—August 31, 1949. See Appendix No. II and No. III for data.

In plant No. 1, where better than 80 percent of the total volume of eggs were size-graded by producers and over 65 percent were sold as "wholesale graded" eggs the plant labor cost averaged 38.4 cents per case; while in plant No. 4 where all the eggs were candled and size-graded into "consumer grades" the plant labor averaged 53.9 cents per case.

Another source of difference in the average cost of labor per case of eggs handled by different plants was the variation in the hourly wage rate paid to the employees. The plants in the rural areas where there were relatively few industrial plants (especially plants employing female labor), paid an hourly wage rate that was below that of the plants located in cities or industrial areas.

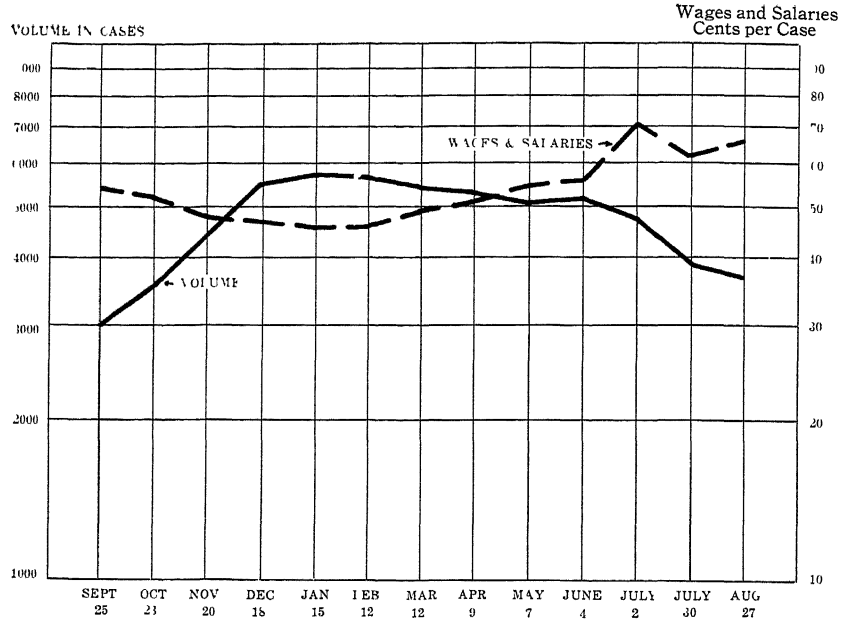


Chart 2.—The relation of the weekly volume of eggs to the plant labor costs per case of eggs handled in Plant #4, September 1, 1948—August 31, 1949. See Appendix No. II and No. III for data.

PART II

VARIATION IN LABOR REQUIREMENTS OF SPECIFIC OPERATIONS IN PLANTS STUDIED

Since plant labor represents almost two-thirds of the plant operating expenses with the remaining costs divided between 10 other items, special attention was given to the variation between plants on the amount of labor required for each specific plant operation.

The causes of the variation in the amount of time required to do specific jobs in the egg processing plants can be listed under three headings: (1) The speed at which the employees worked, (2) the method used to do the work, and (3) the type of equipment used to facilitate the work.

The speed at which an employee works is affected by such things as aptitude, skill, morale, desire, etc. Two employees may be working at the same rate but they may use different methods, hence the method of doing the job may be a second cause of variation in labor output.

Fig. 1.—Effective use of space in egg grading room.

The type of equipment used in unloading, moving eggs in the plant and loading eggs out of the plant had considerable influence on the amount of labor required, and thus became a factor in determining the labor out-put per worker.

This study of labor efficiency is limited to the comparison of methods and various types of equipment used in relation to the labor out-put per worker.

Unloading and Receiving.—The egg receiving operation in the plants consisted of unloading and moving the eggs from the farm route trucks or producers' vehicle to the place where the eggs were held until candled and graded. Checking the eggs delivered by producers, sorting the cases according to color of eggs and whether or not the eggs were size graded by the producer and loading empty cases on the truck or farmer's vehicle were all functions included in this operation. In this study, all of these jobs were considered as one operation because of the method used to determine the amount of time required to perform the various operations.

The methods of unloading and moving the eggs in the plants can be divided into four systems depending on the type of equipment used.

1. Conveyor system. In five plants where conveyors were used the eggs were unloaded from the pick-up trucks or producer's vehicles directly onto roller or power conveyors.

a. In two of the five plants the eggs remained on the conveyors until they reached the egg grading bench and were taken off the conveyor by the candler as needed.

b. In three of the five plants the eggs were transferred from the roller or power conveyor to platforms or skids which were hauled to a place near the candler's bench by "lift jacks".

2. Platform or skid system. In two plants the eggs were loaded directly from the pickup trucks or producer's vehicle onto movable platforms or skids and moved by lift jacks to the candling room.

3. Hand handling system. In one plant the eggs were set off the incoming trucks onto the floor and carried to the candling room one case at a time as needed.

Fig. 2.—Roller conveyor used to take eggs from receiving dock direct to candling bench.

4. Combination system of platforms and conveyors. In one plant, the eggs were loaded onto movable platforms or skids if the eggs were to go directly to the candling room, while the eggs going to the cooler were moved by power conveyor.

In comparing the different systems of unloading and receiving the eggs into the plant, the number of cases handled, regardless of the number of eggs in the case, was used as the basis of comparison.

In two of the plants the eggs were unloaded from the pickup trucks or farmer's vehicle directly on to a conveyor and after entering the building the cases of eggs were sorted and placed on one of three different conveyors depending on whether the eggs were (1) white ungraded eggs, (2) brown ungraded eggs, or (3) eggs graded for size by the producer. Each of these conveyors moved eggs directly to the group of workers handling the particular class of eggs. In these two plants an average of from 83.2 to 135.4 cases of eggs were unloaded and sorted per hour of labor.[2]

In the two plants using platforms or skids the ungraded cases of eggs were sorted for color and the cases of eggs which the producers had hand graded for size were sorted out as the eggs were unloaded from the pickup truck or farmer's vehicle and each class of eggs was placed on a separate skid or platform. In these two plants an average of from 109.7 to 124.5 cases of eggs were unloaded and sorted per hour of labor.

In the one plant in which the eggs were carried to the candling bench by hand, an average of only 78.3 to 90.2 cases of eggs were unloaded and sorted per hour of labor.

It required less time to handle the unloading operation in the plants that picked up most of their eggs at the farms and brought them in to the plant in truck loads instead of having a large number of small

[2]This only included the time spent by the employees within the plant and does not include time spent by truck drivers or producers in helping to perform this function.

TABLE 5.—The average number of cases of eggs unloaded, received and sorted per hour of labor in plants using different methods of handling the eggs

Method of unloading	Number of plants	Number of cases unloaded, received and sorted per hour of labor
Roller conveyor	2	83 2 — 135 4
Two-wheel platforms or skids	2	109 7 — 124 5
Hand	1	78 3 — 90 2

lots of eggs delivered to the plant by different producers. When the eggs were delivered to the plant by the producer, it required time of a plant employee to fill out a receipt and supply the producer with empty cases. The plant with the largest percent of door deliveries of eggs by producers handled the smallest number of cases of eggs per hour of labor.

The efficiency of a plant is also reduced during the seasons of high volume if the plant is too small to handle its peak volume of receipts.

There was a wide difference in the average amount of time required to receive eggs by the various methods of unloading, but the operation of unloading and sorting of eggs and the loading of empty cases accounted for only 2.4% to 3.8% of the total amount of time consumed in the operation of the different plants studied.

The amount of time required to unload, receive and sort the eggs received at the various plants was influenced by:

1. The type and set-up of handling equipment.
2. The amount of sorting necessary at the time of unloading.
3. The number of employees used in the operation.
4. The number and size of shipments coming into the plant.
5. Seasonal fluctuations in volume of eggs.
6. Method of handling producer deliveries.
7. Distance from unloading platform to the candlers.
8. Volume.

Supplying Eggs to Candlers.—The function of supplying eggs to the candlers consisted of moving the eggs from the temporary holding point to the candling bench.

In the plants where the eggs were unloaded from the trucks to the conveyors that carried the eggs to the candling bench, the eggs were lifted directly from the conveyor to the bench by the candler and no additional labor was required to supply the candlers with eggs.

In the plant where the eggs were carried by hand from the temporary storage to the candling bench, an average of 100 cases of eggs were supplied to candlers per hour of labor.

In the plants where incoming eggs were stacked in the receiving room on movable platforms or skids and then moved to the candling room as needed, an average of 140 to 162 cases of eggs were supplied to the candlers per hour of labor.

TABLE 6.—The relation of the type of plant equipment used in supplying eggs to candlers to the amount of labor required

Type of equipment used to supply eggs to candlers	Amount of eggs supplied to candlers per hour of labor (cases)
Conveyors	No labor required
Platforms or skids	140 to 162
By hand (no equipment)	100

Although the operation was not further subdivided, there was some time wasted by candlers "waiting" for eggs and there was considerable variation in the amount of time required in the various plants in handling the empty cases. In the small plants with a small number of candlers, the employee supplying the candlers with eggs also disposed of the empty cases.

While a system of roller or skate-wheel conveyors appears to be the most efficient way of handling incoming eggs, some of the organizations were operating in buildings which were not designed for the efficient use of conveyors.

Supplying eggs to candlers accounted for an average of zero to 4.9% of the total labor requirements in the plants.

Candling and Grading.—This operation consists of examining the interior quality of eggs by twirling the eggs before a candling light to determine the quality grade and then classifying the eggs according to weight into different sizes either by hand scales or egg sizing machines.

The eggs in the different plants were graded according to one or more of three different grading standards, first, U. S. Government Standards for Consumer grades, second, U. S. Government Standards for Wholesale grades, and third, according to standards determined by the individual private operator.

(a) **Grading eggs according to U. S. Government "Consumer Grades"** In this method of grading every egg was examined before a candling light to determine the interior quality and thus the quality grade into which the egg belonged. After the quality of the egg was determined, it was then classified according to size either by a sizing machine or hand scales.

In the plants where one employee candled the eggs and placed them on a sizing machine and another employee took the eggs off the sizing machine and packed them in cases, the entire operation of cand-

ling, sizing, packing, and keeping a "stop and start count" [3] on the eggs from each producer was performed by two employees at an average rate of 4.60 to 5.74 cases of eggs per hour, or an average of 2.3 to 2.85 cases of eggs per hour of labor.

In two plants the size of the eggs was determined by a hand scale, one employee performing all the grading operations including the determination of the interior quality and the size of the eggs, and the repacking of the eggs in the proper quality and size classification. It was not possible to make a direct comparison of the efficiency of this method of operation with the use of the sizing machines as one of these plants did not keep a record of the number of eggs that each individual producer had in the different quality and size classifications. The other plant packed the graded eggs into one dozen cartons rather than in 30 dozen cases.

In the plant which candled and sized eggs by hand but did **not** keep a record of each producer's eggs, the eggs were candled, sized and the Grade A and Grade B eggs packed into one dozen cartons at an average rate of 2.68 to 2.74 cases per hour. The cracks, dirties and Grade "C" eggs were packed in 30 dozen cases.

In the plant where the eggs were candled and sized by hand and packed in 30 dozen cases by the same person, the average rate of production was 3.2 to 3.5 cases of eggs per hour of labor.

(b) **Grading eggs according to "Wholesale" grades.** Grading eggs according to "wholesale" grades was done only on eggs which had been sorted for size by the producer. The grading consisted of candling a sample of approximately 100 eggs from each case and determining the grade of the entire case on the basis of the quality of the sample.

In the plants where eggs were graded according to wholesale standards the out-put varied considerably, ranging from an average of 10.2 to 17.4 cases per hour of labor. This wide range in the number of eggs graded per hour was due to the variation in the actual number of eggs inspected in each case and the number of cases inspected in each shipment. The number of eggs candled from each case varied from pro-

[3] 'Start and stop count"—consisted of taking a count of the eggs in each partially filled case of the different grade of eggs on the candling bench before starting to grade a producer's eggs and making a similar count after finishing the grading of the producer's lot of eggs. The difference between the two counts gave the number of eggs that the producer had in each grade and was used as the basis of payment for the eggs.

Fig. 3.—Skate-wheel conveyor used to take graded eggs from candling bench to holding room.

ducer to producer and at different seasons of the year depending on the judgment of the inspector. During the periods of high volume the eggs were inspected at a faster rate than during periods of low volume.

(c) **Grading eggs according to private grades.** One plant purchased a part of its supply of eggs from Midwestern Dealers and graded these eggs according to their own private standards. The eggs were removed from the cases three dozen at a time by means of a "Car-Pro" lifter.[4] The eggs were placed on an egg grading machine and the eggs were candled as they rolled over a series of lights. This grading machine required four or five people to operate it depending on the speed at which it was operated. The machine handled up to 16 cases an hour with the speed at which it was operated also depending on how close the eggs were graded for quality. It could be operated much faster when the candler only removed the checks and blood spots than when a more complete check of egg quality was made.

A number of factors other than equipment and physical setup were found to influence the efficiency of the operation of candling, sizing and packing eggs in the different plants.

[4]Car-Pro lifter—Mechanical device for transferring 3 dozen eggs at a time.

TABLE 7.—Percent of total volume of eggs graded according to different Standards at each plant

Plant Number	Total volume of eggs sold (Cases)	Percent of total volume of eggs graded according to different standards		
		U. S. consumer grades	U. S. wholesale grades	Private graders
		%	%	
1	109,488	39.6	61.4	. . .
2	80,991	66.1	33.9	. . . .
3	136,295	77.0	23.0	. . .
4	62,137	100.0		. .
5	236,667	78.8	21.2	. . .
6	51,203	33.5	66.5	. . . .
7	35,100	100.0	. .	. .
8	19,895	51.0	. . . .	49.0
9	200,000*	100.0	. . . .	. . . .

*Approximate.

1. In one plant where the candlers had to walk as much as 20 feet to pick up a case of eggs and then carry it back to the candling bench, the average output was 3.3 to 3.7 cases per hour which was considerable below the average output of the 4.6 to 5.7 cases per hour of labor in the plants where the candlers merely slid a case of eggs onto the candling bench from the conveyor right in back of them.

2. Making the start and stop counts and keeping records of the number of eggs in each grade for each individual producer slowed down the grading operation, but where the eggs were being purchased on a quality basis from the individual producers, this was a necessary service. Automatic counters have been developed for use on egg sizing machines and show promise of increasing the efficiency of this operation.

3. The number of cases in a shipment of eggs graded for size by the producer affects the efficiency of inspecting the eggs for quality according to "wholesale" standards because every case in a large shipment may not always be inspected.

4. Personal factors such as experience and age of the candler undoubtedly affect output.

5. Environment or working conditions such as height of candling bench, temperature, light, etc.,may also affect out-put.

The candling operation required an average of from 63.7 to 76.2% of the total hours of plant labor.

TABLE 8.—The percent of the total hours of plant labor spent in candling and grading of eggs during the three test periods

Plant Number	Percent of total plant labor used in grading eggs
	%
1	63.4
2	64.6
3	71.1
4	67.2
5	76.2
6	69.5
7	74.1
8	72.0

Cartoning Eggs

The egg cartoning operation consisted of setting up the cartons, filling the cartons with graded eggs, closing and sealing the cartons and packing them in boxes for shipment. All the plants except one cartoned some eggs. The volume of eggs packed in one dozen cartons by the different plants varied from zero to 89.3 percent of the total volume of eggs graded according to "Consumer Grade" Standards.

TABLE 9.—The percent of total volume of eggs graded according to U. S. Consumer Standards which were packed in one dozen cartons by each plant

Plant Number	Percent eggs graded according to U. S. Consumer Grades which were packed in one dozen cartons
	%
1	39.6
2	12.1
3	34.3
4	6.7
5	7.8
6	25.8
7	50.8
8	0.0
9	89.3

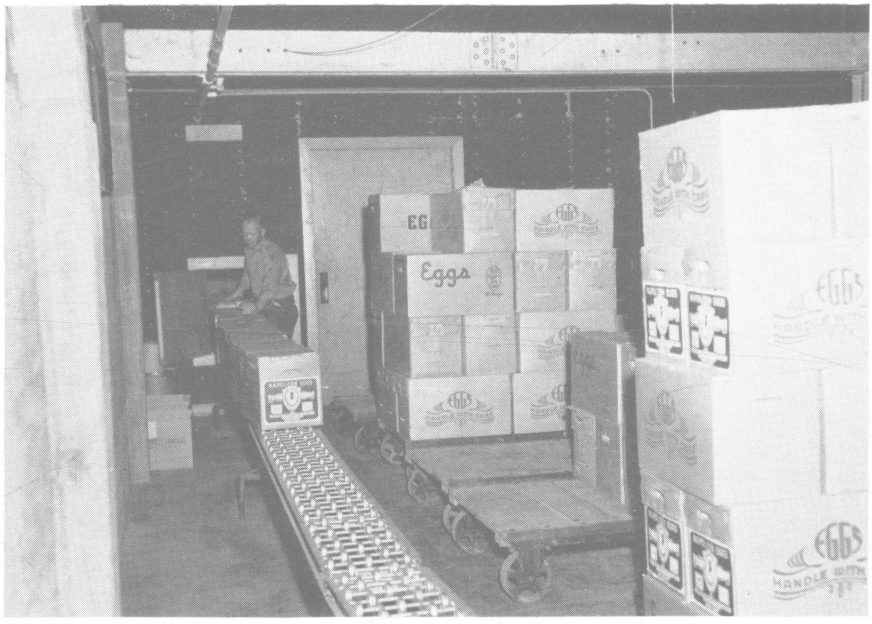


Fig. 4.—Use of combination of skate-wheel conveyor and two-wheel dollies to move eggs in grading plant.

Three general methods of egg cartoning were used by the different plants. In two plants the eggs were candled, sized, and put directly into cartons by the graders. In five plants the eggs were candled, sized and packed into 30 dozen cases, and the eggs were then transferred from the 30 dozen cases to one dozen cartons, usually with 3 dozen Car pro Egg lifters. In one plant the eggs that were size graded by producers were inspected according to "Wholesale Standards" to determine the basis for payment to producers and then the eggs were recandled according to "Consumer Standards" and placed directly into one dozen cartons by the candler.

In four of the plants the entire cartoning operation including setting up, filling, closing and sealing the cartons was done by hand. In the four other plants machines were used to set up the cartons, and other machines were used to close and seal the cartons.

In the plants whose graded eggs were transferred from cases to cartons and the entire operation (setting up, filling, closing, sealing and packing cartons) was done by hand, the average cartoning output varied from 1.8 to 3.3 cases of eggs per hour of labor.

In the plants where machines were used to set up the cartons and conveyor belts tooks the empty cartons to the packer and another belt conveyor took the filled cartons to a carton closing and sealing machine, graded eggs were transferred from cases to cartons at an average rate of 6.08 to 8.84 cases of eggs per hour.

The cartoning operation required an average of from zero to 9.6% of the total hours of plant labor.

Weighing, Sealing and Labelling

In the plants where the eggs were graded under Federal State supervision and packed in 30 dozen cases, each case had to be labelled with the grade and weight of the eggs and the case sealed with a tape stamped with the grade before the eggs were moved into the holding room.

The most efficient method found for this operation was to have the cases transferred by roller conveyors from all the candlers to a central point where one employee weighed and labeled all the cases and moved them into the holding room on a continuation of the same conveyor.

The weighing operation was simplified in some plants by using a scale with roller bearings mounted on top of it so that the case could be turned around to check the other end for old labels as it came onto the scales from the conveyor.[7] Other plants used a mirror so placed that the operator could see the opposite end of the case to check for old labels.

The number of cases of eggs weighed and labeled per hour ranged from an average of 9.0 cases in one plant to an average of 58.2 cases per hour in another plant.

The weighing, labeling and sealing of the egg cases accounted for an average from 2.7 to 5.9 percent of the total hours of plant labor.

Moving Eggs to Holding Room

Three methods were used to transport eggs from the candling room to the holding room. Five of the plants used roller conveyors, two plants put the graded eggs on movable platforms or skids (25 case capacity) and used lift jacks to move the skids into the holding room, and in one plant the graded eggs were taken to the cooler on a hand truck that held 3 cases.

In the plants where the holding room was small in relation to the volume of eggs handled, it required more time to stack the eggs since they had to be stacked higher and there was less room in which to work.

Fluctuations in volume also affected the efficiency of moving the eggs from the grading room to the holding room. At the peak season in volume, it required more labor per 100 cases to handle this operation

[7]See cover picture.

TABLE 10.—Relation of the method of transporting graded eggs from grading room to holding room to the number of cases moved and stacked per hour of labor

Method of transportation	Cases moved from grading room and stacked in the holding room per hour of labor
	(cases)
Hand truck	54.9
Skids	86.7
Roller conveyors	99.9

since it took more time arranging the cases in order to get them into the holding room. The efficiency in each plant varied from season to season in direct relation to the weekly volume of eggs handled. Moving the eggs to the holding room required an average from 1.7% to 6.2% of the total hours of plant labor.

Loading Out Eggs

All nine plants studied were using roller conveyors or belt escalators to load the eggs out of the plants. Power conveyors are especially efficient for loading eggs when the loading platform and the holding room are not on the same level.

Fig. 5.—Escalator used to take graded eggs from basement to truck.

The biggest factor affecting the number of hours of labor required for loading out the eggs was the number and size of shipments. It required less time to load out two or three large truck load shipments per week, than was required to load out fifteen or twenty small orders of a half dozen different grades of eggs.

Loading the graded eggs out of the plant onto trucks required from 1% to 2.4% of the total plant labor.

Summary of the Distribution of Plant Labor Spent on Various Plant Operations

There was a wide range in the percent of the total plant labor used for each of the various plant operations by the different plants.

About two-thirds of all plant labor was used for candling and grading eggs, ranging from a low of 63.4% in one plant to a high of 76.2% in another plant.

The wide variation in the amount of time spent on the various plant operations was due to (1) differences in the methods of operation, (2) differences in the marketing services performed and (3) differences in the efficiency of the plant operations.

TABLE 11.—Range in average percentage distribution of total hours spent on various tasks in selected egg assembly plants during three test periods of one week each

Function	Range in percent of total plant labor
Unloading, receiving, sorting and loading empties	2.4 % to 3.8 %
Supplying eggs to candlers	0.0 % to 4.9 %
Candling and grading	63.4 % to 76.2 %
Cartoning	0.0 % to 9.6 %
Weighing, sealing and labeling	0.0 % to 9.0 %
Stacking in holding room	1.7 % to 6.1 %
Loading outbound trucks	1.0 % to 2.4 %
Setting up and repairing cases	0.0 % to 11.6 %
Janitor and maintenance service	0.0 % to 4.2 %
Miscellaneous—supervision, inventory, breaking eggs, etc.	3.0 % to 6.2 %

Fig. 6.—Weighing, labelling, and case sealing operation in egg grading plant.

SUMMARY AND RECOMMENDATIONS

1. Additional marketing services demanded by both producers and consumers have tended to increase marketing costs during recent years, and have also stimulated emphasis on the need for improving the operating efficiency of egg assemblying plants.

2. The nine marketing organizations included in this survey picked up 82.3% of their total volume of eggs from farms, the remaining 17.7% of their volume was delivered to the plants by producers.

   Collection of eggs from the farms seems to be an essential service in most midwest quality Egg Marketing programs.

3. Experience has shown that paying for eggs on a graded basis is fundamental in inducing procedures to follow production and management practices that will insure good quality eggs and is the crux of most quality egg marketing programs.

   Paying producers for eggs on a quality basis involves an added marketing expense because "counts" of the eggs in each grade must be taken before and after grading the eggs of each individual producer in order to determine the number of eggs in each grade.

4. Labor costs represented about two-thirds of the operating expenses of the egg assembly and grading plants included in this survey.

   Labor was about two-thirds of the total plant operating expenses and was practically the same percent of total plant cost in each of the plants. Labor costs varied from an average of 33.7 cents per case in one plant to an average of 53.9 cents per case in another plant, while the total plant operating expenses varied from an average of 52.4 cents to 82.9 cents per case in different plants.

   Since labor costs are approximately two-thirds of all the egg assembly plant operating expenses, the importance of different methods of operation and types of equipment on the efficiency of a plant cannot be overemphasized.

5. There were at least four factors which had a direct bearing on the plant labor costs in these assembly plant.

   A. **Volume**—There was an inverse relationship between the weekly volume of eggs and the plant labor cost per case of eggs sold. As the volume of eggs increased the plant labor cost per case of eggs decreased.

   B. **Marketing Services Performed**—The number of marketing services performed had a direct effect on the amount of labor required per case of eggs.

      In plant #1 where only one-third of the eggs were graded according to "Consumer Standards" the plant labor cost was 38.4 cents per case; while in plant #4 where all of the eggs were graded according to "Consumer Standards" the plant labor cost was 53.9 cents per case.

      The percent of the total volume of eggs that were packed in one dozen cartons was another marketing service having a direct effect on labor requirements.

   C. **Hourly Wage Rate**—Plants located in rural areas paid a lower hourly wage rate than the plants located in cities or industrial areas.

   D. **Labor Efficiency**—There was considerable variation in the amount of time required to do specific jobs in the egg processing plants due to three possible factors:

      1. The speed at which an employee worked.
      2. The method used in doing the work.
      3. The type of equipment used to facilitate the work.

6. This analysis of the labor efficiency of the various plant operations was limited to a comparison of the effect of the various methods and types of equipment used on the labor output per worker.

   A. **Unloading and Receiving**—In the plants using roller conveyors, an average of 83.2 to 135.4 cases of eggs were unloaded and received per hour of labor, the plants using two wheel platforms or skids averaged 109.7 to 124.5 cases of eggs per hour of labor, and the plant moving eggs by hand unloaded and received an average of 78.3 to 90.2 cases of eggs per hour of labor.

   Both roller conveyors and skids or a combination of the two improved the efficiency of unloading and receiving eggs.

   B. **Supplying Eggs to Candlers**—Plants using roller conveyors required no labor for this operation because the eggs moved on the conveyor direct from the receiving point to the candlers.

   In the plants using platforms or two wheel skids, 140 to 162 cases of eggs were supplied to the candlers per hour of labor and in the plant where the eggs were moved by hand an average of 100 cases of eggs were supplied to the candlers per hour of labor. Conveyors moving eggs from the receiving point directly to the candler were the most economical method of supplying eggs to candlers.

   C. **Candling and Grading—(1) Eggs graded according to the U. S. "Consumer Standards".** In the plants where the eggs were hand candled and mechanically sized the entire operation of candling, sizing, packing and keeping a "Start and Stop" count on the number of eggs in each grade for each producer the average output was 2.3 to 2.85 cases of eggs per hour of labor.

   In each of two plants one person candled and determined the size of the eggs by a hand scale, and no records were kept of the number of eggs in each grade for each producer. In one of the above plants where the eggs were packed directly into 30 dozen cases the average output was 3.2 to 3.5 cases of eggs per hour of labor. In the other plant the Grade A and Grade B eggs were packed into one dozen cartons and all other eggs into 30 dozen cases. The average output in this plant was 2.68 to 2.74 cases of eggs per hour of labor.

(2) **Eggs graded according to U. S. "Wholesale Standards".** In the plants where eggs were graded according to U. S. "Wholesale Standards" the output ranged from an average of 10.2 to 17.4 cases of eggs per hour of labor. This wide variation in the number of eggs graded per hour was due to the variation in the number of eggs inspected for quality in each case and the number of cases inspected in each producers' shipment.

(3) **Eggs graded according to private grades.** In one plant the eggs were removed from the case three dozen at a time by means of a "Car Pro Lifter". The eggs were placed on an endless belt which conveyed them to a series of rollers located over bright lights where the undergrade eggs, checks and blood eggs were detected and removed by the operator. The output per hour varied depending upon the rigidity of the inspection of the eggs. The machine had a possible output of 16 cases of eggs per hour and required four or five people to operate it.

The wide variation in the grading systems made it impossible to appraise the relative efficiency of the different candling and packing methods.

D. **Cartoning Eggs**—In the plants where graded eggs were transferred from cases to cartons and the entire operation (setting up, filling, closing, sealing, and packing cartons) was done by hand the average output varied from 1.8 to 3.3 cases of eggs per hour of labor.

In the plants where machines were used to set up the cartons and a conveyor belt took the empty cartons to the packer and another belt took the filled cartons to a carton closing and sealing machine and another person packed the filled cartons into cases, the average output varied from 6.08 to 8.84 cases of eggs per hour of labor.

It is quite apparent that the mechanical carton setup and closing machines help to greatly improve the efficiency of the cartoning operation.

E. **Weighing, Sealing and Labeling Cases**—In the plants where the cases of eggs from all candlers were transferred by a roller conveyor to a central point where one employee weighed, sealed and labeled the cases for several candlers the output averaged as high as 58.2 cases of eggs per hour of labor. In another plant where the cases of eggs were

carried by hand from each candler to a central point and then were weighed, sealed and labeled the average output was only 9 cases of eggs per hour of labor.

Centralizing the weighing, sealing and labeling of eggs greatly improved the efficiency of this operation.

F. **Transferring Eggs to Holding Room**—In the plants where the eggs were transferred on roller conveyors the average output was 86.7 cases per hour and in one plant where the eggs were moved by hand truck the output was only 54.9 cases of eggs per hour of labor.

The use of roller conveyors proved to be the most economical method of transferring eggs from the candling room to the holding room.

G. **Loading Eggs Out of Plant for Market**—All the plants used roller conveyors or belt escalators to load eggs out of the plant. The biggest factor affecting the output per hour was the number and size of the shipments.

7. Since well designed plants of adequate size for the volume of eggs handled and plants properly equipped with conveyors promote the labor efficiency of the plants, operators should study these factors in both their own plant and other plants in order to achieve the greatest possible efficiency.

8. Plant operators should study the various systems of grading in relation to labor costs and the requirements of the outlets to which they sell eggs in order to be sure that the type of operation in use is the most efficient in meeting their needs.

BIBLIOGRAPHY

Adolph, R. H., and Burdick, R. T. An analysis of the costs of marketing eggs (Abs), Poultry Sci., 27: 651, Sept. 1948.

Baker, R. L., and Sternberger, A. P. Economies of location in grading and cartoning eggs. Pa. Agr. Exp. Sta. Bul. 571. 24 pp. Oct. 1953.

Beanblossom, F. Z., and N. G. Paulhus. "Mechanized handling speeds egg marketing", Marketing Activities. February, 1955, A.M.S., U.S.D.A., Washington 25, D. C.

Bradford, H. W., Ratcliffe, H. E., and Scanlan, J. J. Costs and labor efficiency of specialized egg marketing cooperatives in the Northeast. USDA, FCA, Misc. Rpt. 158, 42 pp., Feb. 1952.

Earle, Wendell. Time and travel requirements in country egg receiving stations. N. Y. Agr. College, A. E. No. 741, July 1950.

Earle, Wendell. Business operations of Northeastern wholesale egg buyers. Bul. 868, Cornell University, Ithaca, New York. May, 1950.

Eggleton, L. Z., and N. G. Paulhus. Pallet system cuts egg handling costs. Marketing Activities, Vol. 17, N. 6, September, 1954. U.S.D.A. Washington 25, D. C.

Gross, E. J., (S. W. Equipment Co.). Can shell egg handling costs be reduced? Poultry Processing and Marketing 59 (3). March 1953.

Johndrew, O. F., Jr. Progress in shell egg packaging. USDA, Mktg. Activ., 14: 15-19. Jan. 1951.

Johnson, E. O. Egg handling cost analysis by large midwestern plant. Amer. Egg and Poultry Rev., 10 (2):83. Feb. 1949.

Larzelere, H. E. Labor costs and utilization in egg grading stations. (Abs.), Poultry Sci., 30: 921-922. Nov. 1951.

Larzelere, H. E. Costs and utilization of labor at four egg grading stations in Michigan. Poultry Sci. Vol. 31, No. 6, P. 1087. Nov. 1952.

Mortenson, W. P. Does it cost too much to market our eggs? Amer. Poul. Jour., 81 (10): 21-22. Oct. 1950.

Mortenson, W. P. Egg marketing margins too wide? Successful Farming, 49 (3): 26ff. March 1951.

Mortenson, W. P. Margins, costs, and profits in egg marketing. Poultry Sci. 29 (5): Sept. 1950.

Paulhus, N. G., and Delle Donne, F. P., PMA-USDA Washington, D. C. Building new or remodeling? Here are some good ideas in planning an egg handling plant. Poultry Processing and Marketing, 59 (9) Sept. 1953.

Paulhus, N. G., and Delle Donne, F. P., PMA-USDA. Modern egg assembly plant. Marketing Activities 16 (2) Feb. 1953.

Paulhus, Norman G., Frank P. Delle Donne. Candling, sizing, packaging and materials—handling equipment and methods used in egg assembly plants. Marketing Research Report No. 47, June 1953. U. S. Department of Agriculture, Washington 25, D. C.

Pearl, E. C. What does it cost to carton eggs? Amer. Egg and Poultry Rev., 12 (9): 34ff., Sept. 1951.

Priebe, E. W., Jr. Know your costs. Analyze your figures. Correct the trouble. U. S. Egg and Poultry Mag., 53 (3):3-8, 1947.

Ratcliffe, H. E., Bradford, H. W., and Scanlan, J. J. Costs of handling eggs by selected cooperatives in the North Central States. USDA, FCA, Misc. Rpt. 162, 47 pp. May 1952.

Scanlan, J. J., FCA-USDA Washington D. C. Costs of handling shell eggs in 25 cooperative plants. Poultry Sci., 32 (5) Sept. 1953.

Trotter, C. E., and Becker, C. A. Cost of candling and cartoning eggs. Pa. Agr. Exp. Sta. paper 1812, 34 pp. Aug. 1953.

Winter, E. P. Marketing margins and costs for poultry and eggs. USDA, Tech. B. 969, 70 pp. Nov. 1948.

USDA-PMA. Minimum requirements for poultry processing and egg packaging plants. 22 pp., 1948.

Small Business Administration—Series No. 4. Improving materials handling in small plants 42 pp. March 1954.

APPENDIX I

Plant _____ Employee _____

Week Beginning _____ Job Title _____

Description of Function	Daily hours spent on each function, to nearest ¼ hour						
	Mon	Tues	Wed	Thur	Fri	Sat	Total
1. Receiving, unloading trucks and loading empties							
Plant labor loading and unloading							
Truck driver's labor (at plant only)							
Receiving & sorting plant deliveries							
2. Empty cases							
Set-up new boxes, add flats & fillers							
Repairing and reconditioning used cases							
3. Graded eggs: Wholesale grade det.							
Bench inspection full cases							
Bench inspection part cases							
4. Graded eggs: Consumer grade det.							
Bench hand candling into cases							
Bench hand candling into cartons							
Hand candling to grading machine							
Packing from machines into cases							
5. Ungraded eggs: Wholesale grade det.							
Size grading with machine							
Bench inspection							
6 Ungraded eggs: Consumer grade det.							
Bench hand candling and sizing into cases							
Hand candling to grading machine							
Packing from machines into cases							
7. Cartoning (other than above)							
Setting-up of one dozen cartons							
Closing sealing of cartons							
Packing cartons into cases							
8. Warehousing, etc.							
Weighing and labeling of cases							
Stacking cases in stock room							
Loading out-bound trucks							
9. General							
Housekeeping and janitor service							
Maintenance and repair							
Taking inventories							
Supervision of personnel and workmanship							
Unaccounted for time							
Other							
Total hours							

APPENDIX II

The Total Volume of Eggs Sold by Five Central Egg Assembling Plants During Each Four-week Period Sept. 1, 1948—Aug. 31, 1949

The four week period ending	Volume					
	Plant #1	Plant #2	Plant #3	Plant #4	Plant #5	Total
September 25	6,705	4,752	7,727	3,042	13,477	35,703
October 23	7,651	5,047	9,462	3,603	16,495	42,258
November 20	10,707	6,537	11,697	4,521	20,669	54,131
December 18	9,202	7,913	13,870	5,639	22,890	59,514
January 15	10,431	7,938	13,262	5,861	22,379	59,871
February 12	9,949	7,495	12,180	5,750	20,996	56,370
March 12	9,381	6,578	11,130	5,473	19,194	51,756
April 9	8,855	6,240	10,747	5,371	18,488	49,701
May 7	7,820	6,020	10,096	5,165	18,354	47,455
June 4	8,314	6,502	10,503	5,265	18,563	49,147
July 2	7,465	5,885	10,113	4,815	16,637	44,915
July 30	6,494	5,125	7,979	3,902	14,342	37,842
August 27	6,515	4,941	8,267	3,730	14,285	37,738
Total volume	109,489	80,973	137,033	62,137	236,769	626,401

APPENDIX III

Average Plant Wages and Salaries per Case of Eggs (30 dozen) Sold by Five Central Egg Assembling Plants During Each Four-week Period Sept. 1, 1948—Aug. 31, 1949

The four week period ending	Cents per Case					
	Plant #1	Plant #2	Plant #3	Plant #4	Plant #5	Average
September 25	42.89	52.84	62.08	54.55	34.80	46.31
October 23	38.10	52.27	57.52	53.28	33.05	43.46
November 20	29.11	45.13	51.24	48.62	29.10	37.42
December 18	36.99	37.78	43.25	47.76	35.89	37.00
January 15	32.13	40.65	53.44	46.13	28.04	37.82
February 12	34.74	40.79	48.14	46.30	30.95	38.21
March 12	34.74	45.50	47.93	49.71	30.98	39.10
April 9	35.94	48.77	50.14	71.41	34.86	41.90
May 7	41.31	48.46	52.06	55.00	35.30	43.72
June 4	39.78	34.49	46.32	56.39	33.55	41.22
July 2	44.47	54.15	52.69	70.62	33.33	47.40
July 30	49.79	57.23	56.08	62.20	40.16	48.39
August 27	52.29	59.48	59.68	66.68	40.62	51.86
Average cost per case	38.40	47.27	51.92	53.87	33.73	

APPENDIX IV

Total Volume of Eggs and the Average Number of Cases of Eggs Sold per Hour of Labor During Each One Week Test Period by Eight Ohio Egg Assembling Plants

Plant Number	Total volume of eggs sold during each one week test period. (cases)				Eggs sold per hour of plant labor during each one week test period. (cases)			
	Sept.-Oct. period	Dec. period	March period	Average of three periods	Sept.-Oct. period	Dec. period	March period	Weighted average
1	2450	3035	2351	2612	3.79	4.44	3.76	4.01
2	1540	2782	2096	2139	2.06	2.62	2.39	2.39
3	2810	4553	2963	3442	2.02	2.67	2.16	2.31
4	1113	1639	1425	1392	1.42	1.67	1.67	1.57
5	4918	7054	5323	5765	2.28	2.71	2.30	2.45
Average	2566	3813	2832	3070	2.64	2.87	2.46	2.59